

We claim:

1. A control device for controlling at least one bottom dump air operated door for a railroad car movable between a closed position in which material within the railroad car is retained within the railroad car and an open position in which the
5 material within the railroad car is released therefrom comprising:

a housing supported by the railroad car;

a piston movable in said housing between a door closing position and a door opening position in response to air pressure

10 acting in a first direction on said piston to cause movement of the door to its open position and to air pressure acting in a second direction on said piston to cause movement of the door to its closed position;

and a control element for preventing air pressure from acting in
15 the first direction on said piston until the air pressure exceeds a predetermined amount.

2. The control device according to claim 1 in which said control element comprises a pressure responsive element between a source of air pressure and said piston to block supply of air pressure in the first direction for preventing the air pressure
5 from acting in the first direction on said piston until the air pressure exceeds a predetermined amount.

3. The control device according to claim 2 comprising:

a first air passage in said housing communicating with a source of air pressure to cause air pressure to act on said piston

in the first direction to move said piston to its door
5 opening position when said piston is in its door closing
position;

and said pressure responsive element comprising:

a first portion movably disposed in said first air passage;
and a second portion holding said first portion in a passage
10 blocking position until the air pressure exceeds a
predetermined amount.

4. The control device according to claim 3 in which said second portion of said pressure responsive element is a resilient element disposed in said first air passage and continuously urging said first portion of said pressure responsive element into its passage blocking position when the air pressure does not exceed the predetermined amount.

5. The control device according to claim 4 in which:

said first air passage has a reduced area portion;
and said first portion of said pressure responsive element is a ball urged into engagement with said reduced area portion of
5 said first air passage by said resilient element to hold said ball in its passage blocking position.

6. The control device according to claim 5 comprising:

a second air passage in said housing communicating with the source of air pressure to cause the air pressure to act on
said piston in the second direction to move said piston to
5 its door closing position when said piston is in its door opening position;

a first activating element for allowing the air pressure to be applied to said piston to cause movement of the door to its open position when said ball is not in its passage blocking 10 position and the railroad car is at a first predetermined position at which it is desired for the door to open to release the material in the railroad car;

and a second activating element for allowing the air pressure to be applied to said piston to cause movement of the door to its closed position when the railroad car is at a second predetermined position at which it is desired for the door to close, the second predetermined position being spaced a predetermined distance in the direction of movement of the railroad car from the first predetermined position.

7. The control device according to claim 6 in which:

said first activating element comprises a first solenoid activated in response to the railroad car being at the first predetermined position to cause the air pressure to be applied to said piston in the first direction to cause movement of the door to its open position;

and said second activating element comprises a second solenoid activated in response to the railroad car being at the second predetermined position to cause the air pressure to be applied to said piston in the second direction to cause movement of the door to its closed position.

8. A control device for controlling at least one bottom dump air operated door for a railroad car movable between a closed

position in which material within the railroad car is retained
within the railroad car and an open position in which the
5 material within the railroad car is released therefrom
comprising:

a housing supported by the railroad car and having a sealed
interior;

said housing having first and second chambers aligned with each
10 other in its sealed interior and spaced longitudinally from
each other;

a piston slidably disposed within the sealed interior of said
housing;

said piston having:

15 one end disposed in said first chamber in sealing relation
therewith;

and its other end disposed in said second chamber in sealing
relation therewith;

a first end cap mounted at one end of said housing;

20 said first end cap having a first air passage communicating with
the sealed interior of said housing exterior of said first
and second chambers and a second air passage communicating
with said first chamber;

a first solenoid supported by said first end cap, said first
25 solenoid allowing air pressure to flow through said air
passage in said first end cap to said second air passage in
said first end cap when said first solenoid is activated;

a second end cap mounted at the other end of said housing;

30 said second end cap having a first air passage communicating with
the sealed interior of said housing exterior of said first
and second chambers and a second air passage communicating
with said second chamber;

35 a second solenoid supported by said second end cap, said second
solenoid allowing air pressure to flow through said first
air passage in said second end cap to said second air
passage in said second end cap when said second solenoid is
activated;

40 a sliding shoe valve disposed within the sealed interior of said
housing exterior of said first and second chambers and
connected to said piston for movement therewith;

45 said housing having a port communicating a source of air pressure
with the sealed interior of said housing exterior of said
first and second chambers;

50 said housing having two ports communicating with a control member
for moving the door to its open or closed position depending
on the position of said sliding shoe valve relative to said
two ports, one of said two ports supplying air pressure to
the control member from the sealed interior of said housing
exterior of said first and second chambers when the door in
the railroad car is to be opened and the other of said two
ports supplying air pressure from the sealed interior of
said housing exterior of said first and second chambers to
the control member when the door in the railroad car is to
be closed;

55 said first air passage in said first end cap supplying air pressure from the sealed interior of said housing exterior of said first and second chambers through said second air passage in said first end cap to said first chamber to move said piston to its door opening position when said first
60 solenoid is activated;

said first air passage in said second end cap supplying air pressure from the sealed interior of said housing exterior of said first and second chambers through said second air passage in said second end cap to said second chamber to move said piston to its door closing position when said
65 second solenoid is activated;

and a control element disposed in said first air passage in said first end cap for preventing air pressure to pass therethrough until it exceeds a predetermined amount.

9. The control device according to claim 8 in which said control element comprises a pressure responsive element in said first air passage in said first end cap between the sealed interior of said housing exterior of said first and second chambers and said second air passage in said first end cap to block supply of air pressure through said second air passage to said first chamber for acting on said piston to move said piston to its door opening position when said piston is in its door closing position and said first solenoid is activated until the
5 air pressure exceeds a predetermined amount.
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10. The control device according to claim 9 in which said pressure responsive element comprises:

a first portion movably disposed in said first air passage in said first end cap;

5 and a second portion holding said first portion in a passage blocking position until the air pressure exceeds a predetermined amount.

11. The control device according to claim 10 in which said second portion of said pressure responsive element is a resilient element disposed in said first air passage in said first end cap and continuously urging said first portion of said pressure responsive element into its passage blocking position when the air pressure does not exceed the predetermined amount.

5 12. The control device according to claim 11 in which: said first air passage in said first end cap has a reduced area portion;

and said first portion of said pressure responsive element is a ball urged into engagement with said reduced area portion of said first air passage in said first end cap by said resilient element to hold said ball in its passage blocking position.

13. A control device for controlling at least one bottom dump air operated door for a railroad car movable between a closed position in which material within the railroad car is retained within the railroad car and an open position in which the

5 material within the railroad car is released therefrom comprising:

a housing supported by the railroad car and having a sealed interior;

10 said housing having first and second chambers aligned with each other in its sealed interior and spaced longitudinally from each other;

a piston slidably disposed within the sealed interior of said housing;

said piston having:

15 one end disposed in said first chamber in sealing relation therewith:

and its other end disposed in said second chamber in sealing relation therewith;

a first end cap mounted at one end of said housing;

20 said first end cap having a first air passage communicating with the sealed interior of said housing exterior of said first and second chambers and a second air passage communicating with said first chamber;

25 a first activating element supported by said first end cap, said first activating element allowing air pressure to flow through said first air passage in said first end cap to said second air passage in said first end cap when said first activating element is activated;

a second end cap mounted at the other end of said housing;

30 said second end cap having a first air passage communicating with
 the sealed interior of said housing exterior of said first
 and second chambers and a second air passage communicating
 with said second chamber;
 a second activating element supported by said second end cap,
35 said second activating element allowing air pressure to flow
 through said first air passage in said second end cap to
 said second air passage in said second end cap when said
 second activating element is activated;
 a sliding shoe valve disposed within the sealed interior of said
40 housing exterior of said first and second chambers and
 connected to said piston for movement therewith;
 said housing having a port communicating a source of air pressure
 with the sealed interior of said housing exterior of said
 first and second chambers;
45 said housing having two ports communicating with a control member
 for moving the door to its open or closed position depending
 on the position of said sliding shoe valve relative to said
 two ports, one of said two ports supplying air pressure to
 the control member from the sealed interior of said housing
50 exterior of said first and second chambers when the door in
 the railroad car is to be opened and the other of said two
 ports supplying air pressure from the sealed interior of
 said housing exterior of said first and second chambers to
 the control member when the door in the railroad car is to
55 be closed;

60 said first air passage in said first end cap supplying air pressure from the sealed interior of said housing exterior of said first and second chambers through said second air passage in said first end cap to said first chamber to move said piston to its door opening position when said first activating element is activated;

65 said first air passage in said second end cap supplying air pressure from the sealed interior of said housing exterior of said first and second chambers through said second air passage in said second end cap to said second chamber to move said piston to its door closing position when said second activating element is activated;

70 and a control element disposed in said first air passage in said first end cap for preventing air pressure to pass therethrough until it exceeds a predetermined amount.

14. The control device according to claim 13 in which said control element comprises a pressure responsive element in said first air passage in said first end cap between the sealed interior of said housing exterior of said first and second chambers and said second air passage in said first end cap to block supply of air pressure through said second air passage to said first chamber for acting on said piston to move said piston to its door opening position when said piston is in its door closing position and said first activating element is activated until the air pressure exceeds a predetermined amount.

15. The control device according to claim 14 in which said pressure responsive element comprises:

a first portion movably disposed in said first air passage in said first end cap;

5 and a second portion holding said first portion in a passage blocking position until the air pressure exceeds a predetermined amount.

16. The control device according to claim 15 in which said second portion of said pressure responsive element is a resilient element disposed in said first air passage in said first end cap and continuously urging said first portion of said pressure responsive element into its passage blocking position when the air pressure does not exceed the predetermined amount.

5 17. The control device according to claim 16 in which:

said first air passage in said first end cap has a reduced area portion;

and said first portion of said pressure responsive element is a

5 ball urged into engagement with said reduced area portion of said first air passage in said first end cap by said resilient element to hold said ball in its passage blocking position.